

ENGINEERS AUSTRALIA

ENGINEERING HERITAGE QUEENSLAND

ENGINEERING HERITAGE RECOGNITION

SOUTH BRISBANE DRY DOCK

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DESCRIPTION

Submitted by: Engineering Heritage
Queensland Panel

Prepared by: Neville Brown

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By: David Jones and Peter Norman
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"Review of Technical Heritage"

By: Ian Jempson
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Queensland Maritime museum
Brisbane Graving Dock
Brief History of 90 Years of Service 1881-1971

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BASIC DATA

Item Name – South Brisbane Dry Dock (It should be noted that some references to the Dry Dock use the term “Graving Dock”. Graven is a Middle English word meaning to clean the bottom of a ship and coat with pitch. The term dropped from use in the late 1800s)

Location – Brisbane River, South Bank

City – Brisbane

State – Queensland

Local Government Area – Brisbane City Council

Owner – Maritime Museum South Bank

Current Use – Centre piece of Maritime Museum with HMAS Diamantina installed within the dock

Designer – William Nesbit - Chief Engineer Queensland Government

Construction Firm – James and Acheson Overend

Construction Program – Started 1876

Completed	Stage 1	September 1881
	Stage 2	Early 1887 (Necessary Extension)

Physical Description –	Dock Width	24 m at ground level
		16 m at bottom level

Length	Stage 1	97 m
	Stage 2	131 m

Depth	9.15 m
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Floor and Walls – Porphyry Blocks with Helidon Sandstone in upper courses
Extension Stage unlined side walls

Sealed by removable caisson during usage years

Sealed permanently Sept. 2006 with HMAS Diamantina (River Class Frigate) located within the dry dock

Caisson Details Iron construction as narrow vessel, tapered ends and wider bottom

Dewatering Pumps Two off Double Acting Centrifugal rated at discharging 27,280 litre of water per minute through .9 m pipe with 6m lift to river and fitted with a Counter weighted non-return valve

Counter weighted Each pump was direct coupled to horizontal non-return valve

	direct acting high pressure steam engine
Boilers -	Three coal fired Cornish to Nesbit Specifications installed at surface Manufactured Evans, Anderson and Phelan, Kangaroo Point
Electric Motors -	Two electric motors installed 1925 at ground level with rope drives to the two centrifugal dewatering pumps installed in dewatering pit
Physical Condition	– Maintained as part of the Queensland Maritime Museum.
Heritage Listing	Application to Engineering Heritage Australia commenced 2015

INTROCUCTION/HISTORY

SOUTH BRISBANE – DRY DOCK

From the first white settlement in Sydney 1788, shipping trade with Australia was predominantly inbound from the Cape of Good Hope route and outbound via Cape Horn. As such shipping to Brisbane was via small sailing craft from Southern States until 1881 when a contract was established for steam ships travelling through the Suez Canal and via Torres Straight to terminate at Brisbane.

In 1867 dredging of the Brisbane River had begun and the justification for a dry dock was raised. Cost estimates were submitted in 1874 and a site was proposed which remained the preferred choice for all subsequent reviews. This was at the bend of the river at South Brisbane.

Several estimates were reviewed with concern at cost escalation until 1875 when tenders were called and a contract placed on 28th of January 1876 with James and Acheson Overend to carry out the work for a sum of £61,963/13/- with some extras for spreading spoil and a bonus incentive to complete the work earlier. The completion date was set for 31 December 1878 and cost penalties for time overrun were included.

The design of the dry dock was prepared by William Nesbit, Chief Engineer for Harbours and Rivers, who replaced the retiring Chief Engineer Mr A.J. Goldsmith. Nesbit's design provided for extensive lining of the Dock excavation with local porphyry blocks and sandstone. The dock was to be capable of accommodating vessels up to 320 FT in length and 50 Ft beam. The dock was sealed from the river by a movable Caisson or gate which fitted to seal the dock entrance from the river. Double acting centrifugal pumps were installed to dewater the dock.

During construction progress was delayed due to unavailability of required stone and a brick to line the excavation and two flooding's which occurred when the Coffey Dam protecting the excavation from the river failed. These flooding's and materials delays resulted in the first ship entering the completed dock on 10 September 1881.

As with any project subject to a time overrun there was an inevitable cost escalation and the final project cost was £83,849/8/9. Records indicate that the Government had reassessed the likely final cost and a sum of £88,000 had been voted to cover final cost. In addition although J&A Overend and Co. was eligible to incur a three year overrun penalty for late completion the government reduced the penalty to one year, eight months and ten days. Whilst the concession must have reduced the contractor's costs the contractor did concede that the project was a "Great Monetary Loss".

Once commissioned the dock was in regular use as Queensland shipping increased including the steam shipping line with UK via the Suez Canal. Additional workshop facilities to service docked vessel were installed and surrounding facilities increased.

However with increased shipping and of greater size it was realised that an extension of the dock length was required. In October 1886 a contract was let to G. Bowser to increase the dock by 100 ft. in length and this was completed early in

1887. This increase provided for all shipping needs in future years and in 1889 it was recorded that 95 vessels were docked and received attention.

During the 1890's the Brisbane River experienced several severe floods but no major damaged occurred to the dock.

Into the twentieth century the dock met the majority of shipping demands and also its base work load of servicing of the fleet of River dredges required to keep the Brisbane River suitable for commercial shipping.

Whilst the 1914 – 1918 war was too remote to provide much demand on the Brisbane dock circumstances changed in the 1939-1954 war when Japan entered the conflict and forces and resources from the United States began to be active in Queensland. In the year 1943 a total of 88 vessels received attention at the South Brisbane dock, 29 being US submarines and 27 were US and Australian warships.

One major repair was to the submarine USS Growler which had bent its bow at right angles in ramming a Japanese warship. This submarine was berthed at the South Brisbane dock and its damaged bow replaced by a new bow fabricated at a local river side workshop.

Subsequently to WW2 the dock resumed normal business but workload was impacted by the availability of the new Cairncross dock completed in the last years of WW2 at a more accessible section downstream on the Brisbane River.

A final impact on the future of the South Brisbane dock was the construction of the Captain Cook Bridge (Gardens Point Bridge) which isolated the South Brisbane dock from the lower reaches of the Brisbane River and major shipping. This was completed in November 1971. A number of smaller vessels used the South Brisbane dock after this date but the final usage was September 1972. The official closing date was selected as 22nd September 1972 exactly 91 years after the first vessels entered the South Brisbane dock and 5007 vessels later.

When it initially became known in the late 1960's the dock would close as an operating facility, concern was raised regarding the ongoing future of the dock and the supporting infrastructure. This resulted in the formation of steering committee in 1967 to access the possibility of establishing a Queensland Maritime museum. Further meetings resulted in a letter to the Queensland Premier in March 1971 to obtain the dock site under trust as a Maritime museum with the responsibility for the operation been with the newly formed Queensland Maritime Museum Association (QMMA).

Following serval exchanges of letters the QMMA was advised on 11 April 1973 that permission was granted for the QMMA to enter the dock lands with authority to establish a museum. Development of the area commenced soon after and continued until 1 January 1980 when the museum was finally opened to the public. The community response was over 1000 visitors in the first month and continued to increase.

During this museum development period (1973 – 1980) the area was continually upgraded via volunteer labour and receipt of several grants to cover specialised

work. One setback occurred in January 1974 when the Brisbane River flooded part of the area but flood relief funding assisted the recovery.

In April 1971 the Queensland Tug company handed over the Tug "Forceful" to be exhibited at a mooring adjacent the dock entry. A further acquisition was the River Class Frigate HMAS "Diamantina" following the official opening in January 1980. This vessel was sailed from Garden Island, Sydney with a crew including several QMMA members and finally came to rest in the dock at the Maritime museum in late February 1981.

On 22nd September 1981 the Queensland Maritime museum was officially opened by the Governor of Queensland, 100 years from the day when the first vessel entered the Dock.

The 1988 Expo event was the next major involvement for the Maritime museum and the exhibition proved a popular attraction over the period of the Expo with approximately one million visitors passing through the museum.

Over the years of the dock being in service River flooding had proved to be only an infrequent event and no major consequences had directly resulted. However in 2006 it was evident that the Caisson gate sealing the dry dock from the River needed to be replaced as it was beyond repair. The decision was made to replace the caisson with a permanent river wall and this was installed by September 2006 ensuring that the dry dock will now be a permanently sealed enclosure for the HMAS Diamantina.

On 21 March 1978 the dry dock was listed in the register of the Natural Heritage Commission and in 21 October 1992 the dry dock was included in the Queensland Government's State Heritage Register.

ASSESSMENT OF SIGNIFICANCE

Historical Significance

The South Brisbane Dry Dock played a significant role in the development of Brisbane as the port of choice for the Southern area of Queensland, both for the city and the country hinterland. Brisbane was started as a Penal Settlement in 1824 serviced by small shipping from Sydney. However following the pastoral development of the Darling Downs in 1827 shipping traffic in and out of Brisbane began to increase. The opening of rail services West and North during the 1860s also increased the need for greater volume of traffic through the port and the opening of the Suez Canal in 1869 resulted in overseas vessels travelling direct to Brisbane via the Torres Strait route.

The increased shipping movements up the Brisbane River to the city docks in turn produced a need for dredging the river at some areas. Once a small dredging fleet was procured in 1867 the need for a facility to service and maintain the vessels became necessary. The logical choice was a dry dock and it was considered such a facility could also become available to the vessels entering the port of Brisbane.

In 1874 the first attempt at an estimate for the dry dock was prepared at 25,000 pounds by Mr. Francis Ross, Chief Engineer of Harbours and Rivers. Unfortunately Mr Ross died shortly after and Mr. A. J. Goldsmith at 26 years of age became his successor. Mr. Goldsmith had some experience in dry dock installations having previously worked at Biloela Dock, Cockatoo Island in Sydney. His assessment of the estimate of Mr Goldsmith was that it was "absurd".

Mr Goldsmith's assessment of the rock material in the area of the proposed dock site was that it would not require lining (subsequently proved correct) and his estimate to construct the dry dock was submitted at 49,361/12/- pounds.

This was a shock to the Government but two months later a greater shock was when the new Chief Engineer, Mr. William Nesbitt (replacing retiring Mr Goldsmith?) submitted his estimate at 81,000 pounds. Nesbitt's design provided for extensive lining of the dock excavation with local porphyry blocks and sandstone.

In 1875 after a period of parliamentary consideration of alternatives, design and cost estimates were accepted for a dry dock to be constructed at the bend of the Brisbane River at South Brisbane. Tenders were subsequently called and a Contract was finally awarded on 28 January 1876 to the firm of James and Acheson Overend to carry out the work for a sum of 61,963 pounds with 837 pounds in extras for spreading the excavated soil on roads adjacent to the work site. This was to raise the road levels above flood level. Completion date was set for 31 December 1878 and cost penalties for overrun were included.

The design of the dry dock was prepared by William Nesbit (Refer Historical Individual below), Chief Engineer for Harbours and Rivers. Nesbit's design is detailed in "Creative or Technical Achievement" below.

Construction was delayed due to material availabilities and two flooding's of the excavation when the coffer dam protecting the excavation from the river failed.

These delays resulted in the first ship, the barque "Doon", entering the completed dock on 10 September 1881, some almost three years late.

With the extended construction time the final cost also escalated to 83,849 pounds. Records indicate that the Government had made provision for a final cost of 88,000 pounds. In addition the Government reduced the overrun penalty to one year, eight months and ten days. Whilst the concession may have reduced the Contractor's penalty it was conceded that the project was a great monetary loss.

Refer attached Construction Project Cost Summary and Time Line. (Page 14-15)

Once commissioned the dock was in regular use as Queensland shipping increased. Additional workshop facilities were added and the surrounding facilities were increased. This enabled extensive repairs to be carried out on damaged vessels.

However with increased shipping of greater size it was soon clear that it was necessary to extend the length of the dock. A contract was awarded to G. Bowser to increase the dock in length by 34 m and this was completed in early 1887. The extension was not constructed as for the original as the excavated rock walls were proven of sound material and only the floor was sealed with concrete. This extension was the final excavation and the dock with a length of 131 m proved adequate for all shipping over the life of the dock.

From commencement of service the dock operated at a profit for every year except 1919 until 1925. The years up until WW2 were non-profit years for the operation of the dock but during WW2 and until final closure in 1972 the dock operated at a profit.

Historical Individual

The engineer for the development of the Dry Dock Project was William D. Nisbet who was responsible for the design, estimate and contracting of the overall project. He joined the Government Services in 1875 as Engineer for Harbours and Rivers and over a fourteen year period contributed to harbour development along the length of the Queensland coast. He was originally from England and had a background of coastal engineering and associated support services.

He was also active in the development of the Railway Workshops at Ipswich located some 25 miles up-river from Brisbane.

Creative or Technical Achievement

The design was of a standard concept of the age using available materials and constructing the sides and bottom with block form. The most significant engineering input was the selection of the site. The caisson was designed to be floated free to permit ship access to the dock and then positioned to seal the dock and permit dewatering.

The steam driven pumps were capable of pumping the dock dry in about four hours. The pumps were double acting centrifugal powered by a pair of horizontal direct acting high pressure steam engines bedded beside the pumps. The pumps and steam engines were installed in a pit 7.9 m deep lined with Kangaroo point porphyry blocks. This pit provided a suction well 1.5 m deeper than the dock floor. It was designed to direct all water from the drains in the dock floor into the pumps to provide suction.

Steam power was from three coal fired Cornish Boilers manufactured in Brisbane. In 1925 electric motors at surface level replaced the two steam engines and rope drives were used to link between the pit pumps and the ground level electric motors.

Research Potential

Design followed proven practice.

Social Relevance

The dry dock was adjacent existing South Brisbane community areas and presumably many of the workforce providing the maintenance resources were located in the area.

The smoke from the boilers which provided steam power for the dewatering pumps and machinery drives in the maintenance workshops was identified as a concern to the wellbeing of the local community.

Prior to completion of the Brisbane City Swimming Baths in 1926 the dry dock was used for many swimming events including visits by overseas champions and attendances on special occasions often exceeded 2500.

When the dock was identified for closure during the 1960s steps were taken to convert the dry dock to a Maritime Museum. This finally occurred after a significant organisation was established and the Museum was officially opened on 1 January 1980 with an attendance in excess of 1000 persons.

The museum is now a popular feature of the South Bank complex and provides a popular venue for organised groups and individuals alike.

Rarity

Not applicable to this installation.

Integrity/ Intactness

As the dry dock is assessed as part of the maritime museum the site has been well maintained and upgraded to comply with modern site requirements in a community area.

The condition of the original equipment has been maintained to provide a clear example of how the original operation was performed.

STATEMENT OF SIGNIFICANCE

The significance of the South Brisbane Dry Dock is not any uniqueness in design as it is constructed by standard principles. The significance is that it provided a maintenance service for 5007 vessels over 91 years including a high demand by the Allied War effort during World War II.

The dock was why the US Navy chose Brisbane as its submarine base for the South Pacific with 24 submarines and 2 tenders. These submarines in three years sunk over half a million tonnes of enemy shipping; this equated to about one tenth of Japanese vessels sunk by submarines.

From its inception the contribution of the dock was significant in that it maintained the river dredging fleet which was necessary to enable the Brisbane River to provide safe access to overseas shipping which was critical to the development of Queensland.

It was this safe access that enabled the Queensland Government to contract for a direct shipping service between London and Brisbane commencing in 1881 which in turn advanced the economy of the State

Now part of the Brisbane Maritime Museum all equipment is well maintained and is a popular tourist and local attraction as part of the South Brisbane entertainment area.

The dry dock now stands as a long serving facility in the development of Brisbane and provides a significant historical record of its progress.

PROPOSAL FOR HERITAGE RECOGNITION CEREMONY

Subject to the submission for the South Brisbane Dock being approved by Engineering Heritage Australia it is proposed that the Recognition Ceremony be held at the site in consultation with the Dry Dock Museum authority who have overall responsibility for the site.

The Dry Dock Museum already has a number of Recognition Panels installed in the Museum area which cover items such as HMAS Diamantina, Tug Forceful and a sections of the dry water dewatering pumps, drives and workshops.

The dry dock heritage recognition ceremony would follow the procedures set out in "Guide to Engineering Heritage Recognition Program" and approved by EHA National Board November 2012.

COST DETAILS

NEW GRAVING DOCK.—The new Graving Dock was opened on the 10th September last, and since then has been very fairly occupied.

It appears to be a great boon to the port, as several vessels have been repaired here in consequence of the existence of the Dock that must otherwise have gone to Sydney.

The total cost of the work has been as follows:—

	£	s.	d.	£	s.	d.
Masonry, &c.	63,972	0	2			
Caisson	8,106	17	5			
Engines and pumps	1,703	15	5			
Boilers	1,130	9	5			
Sluice valves	278	14	0			
Engine and boiler houses, chimney, erection of machinery, &c.	3,473	16	4			
Excavation boiler house site ..	400	9	7			
Purchase of land, preliminary surveys, borings, inspection, engineer's expenses, and contingencies ..	4,230	11	6			
Clam-shell dredge (Government Account)	85	12	5			
Outfit account	393	15	7			
Working expenses from 10th September, when Dock was opened, to 31st December, 1881, when cost of working was commenced on Revenue Account ..	173	16	5			
Less earnings, being actual receipts exclusive of work done on Government Account ..	165	6	6			
				10	9	11
Total cost				£83,849	8	9

Estimated cost and amount voted, £88,000, exclusive of outfit.

The following table shows the cost of working and earnings for the first eight months of the present year:—

Month, 1882	No. of Vessels using Dock.	Working Expenses	EARNINGS.						Total.
			Actual Receipts.			On Government Account.			
			£	s.	d.	£	s.	d.	
January	1	23 7 0	...	...	...	30 0 0	...	...	54 7 0
February	2	23 10 11	30	0	0	30 12 0	...	...	69 12 0
March	3	34 3 11	33	6	0	40 0 0	...	...	73 0 0
April	2	27 18 1	...	...	...	57 10 0	...	...	84 18 0
May	2	46 16 6	459	16	0	30 0 0	...	...	489 16 0
June	6	86 0 11	192	7	6	45 0 0	...	...	237 7 6
July	6	56 8 11	274	7	0	65 0 0	...	...	329 7 0
August	5	54 0 8	92	16	0	125 0 0	...	...	217 16 0
Total	26	302 7 2	1,082	12	6	482 2 0	...	...	1,564 14 0

Construction Timeline of the Brisbane Graving Dock, South Brisbane:

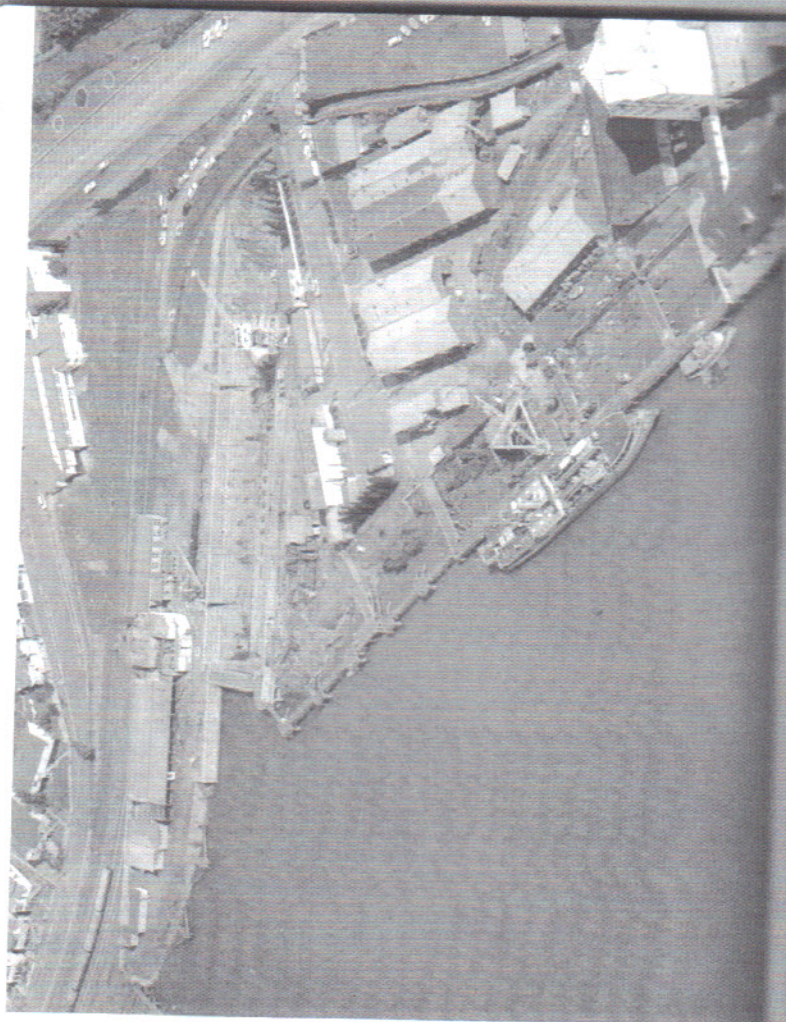
26 April 1874	Harbour Master, Captain Heath, announced a site chosen at South Brisbane for building a dry dock;
10 August 1875	Parliament voted first funds for constructing a dry dock;
12 January 1876	Tenders for construction of the dry dock closed;
28 January 1876	Contract for construction awarded to J & A Overend & Co.;
11 February 1876	Excavation commenced;
30 December 1876	Excavation of dock sides completed;
24 April 1877	Excavation of the bottom of the dock completed;
4 December 1877	Bottom of dock covered by concrete, and pump shafts and tunnels completed;
31 December 1878	Contracted completion date, but work considerably delayed by unavailability of suitable stone and bricks;
9 January 1879	Masonry completed on one side of the dock and well advanced on the other; caisson (dock gate) under construction in the dock;
9 May 1879	Dock flooded accidentally due to failure of cofferdam caused by heavy rain;
8 August 1879	Sluice gates, pumps, engines and steam boilers all previously delivered and available for installation;
13 December 1879	Cofferdam failed for a second time and the dock was again flooded;
20 September 1880	Caisson completed and fitted in place sealing the entrance to the dock;
10 September 1881	First vessel, the barque <i>Doon</i> , entered the dock;
20 September 1881	Constructing firm Overends advised project completed.

SIGNIFICANT SHIPS

10 September 1881	Scottish iron barque "Doon". Badly damaged on reef off Queensland coast. First ship to enter dock. No charge as gesture of good will.
28 September 1881	Bucket dredge "Groper" commissioned 1876 with hopper barge "Snapper". Both required overhaul and awaited dock to open.
27 October 1889	"Taroba" of Royal Mail Service for London struck uncharted rock on voyage to Mackay. Was longest ship to use extended dock.
13 December 1907	British freighter "Indramaya" entered dock for clean and paint. Occupied full length of dock.
5 September 1919	Coastal freighter "Camira" Badly damaged at Flat Rock off Point Lookout. Longest repair at dock - over 3.5 months.
1 March 1942	HMAS "Swan" was first WW2 battle repairs undertaken in dock.
! May 1943	US submarine "Growler" in dock with damaged bow after collision With Japanese destroyer. US Navy commendation for quality of repairs including replacement bow.
14 July 1943	Free French Super destroyer "Le Triomphant" was largest warship to enter dock (length 132.4 m). Rakish bow extended beyond dock floor.

Aerial View of South Brisbane Dry Dock in 1965

PHOTOGRAPHS

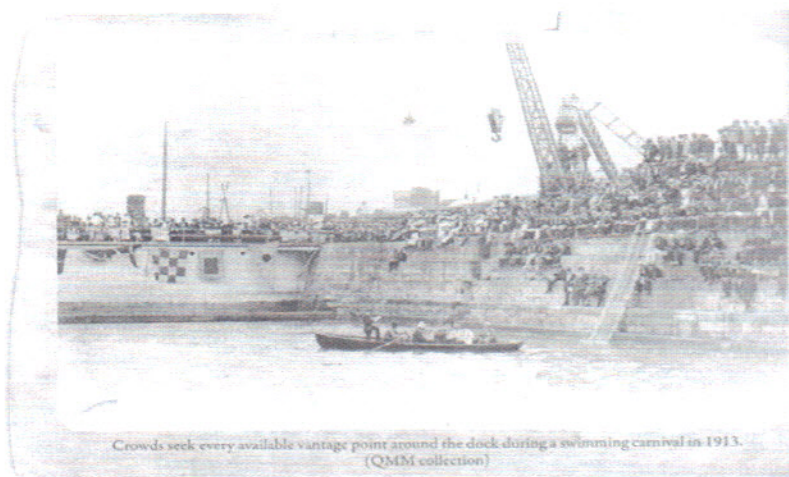


Aerial view of the South Brisbane Dry Dock complex in 1965 showing the extensive array of buildings added during the war along with the greatly lengthened breasting wharf with the dredge *Morwong* alongside. (Reproduced with permission of State of Queensland (Department of Transport and Main Roads) 1965. Port of Brisbane Photographs, Queensland State Archives, series ID 2820, item ID 17827, photo n°48)

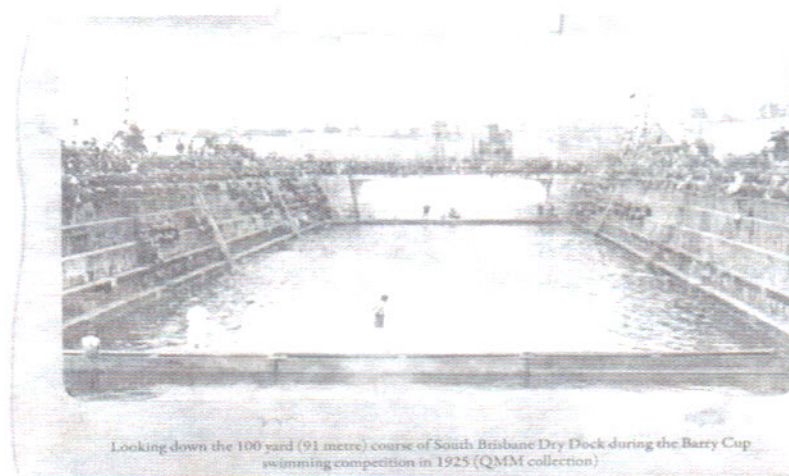
Newly completed by
October 1962 prior to
Queensland (Dept)

Cairns

1925 Swimming Championship held in South Brisbane Dry Dock



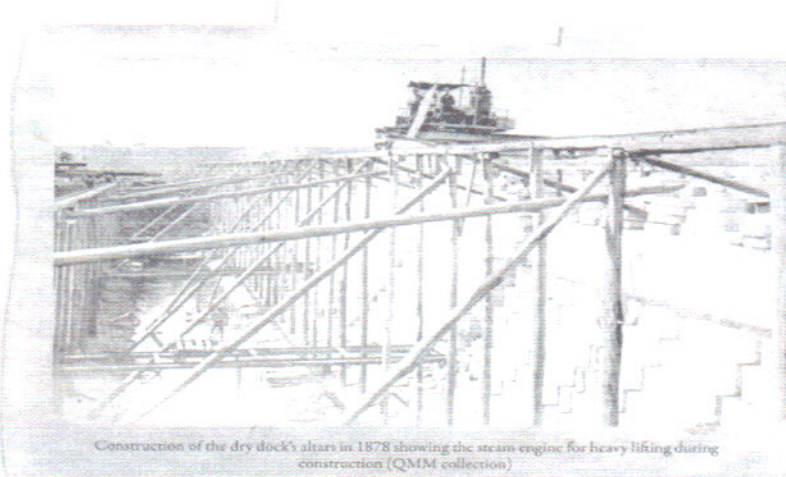
Crowds seek every available vantage point around the dock during a swimming carnival in 1913.
(QMM collection)



Looking down the 100 yard (91 metre) course of South Brisbane Dry Dock during the Barry Cup
swimming competition in 1925 (QMM collection)

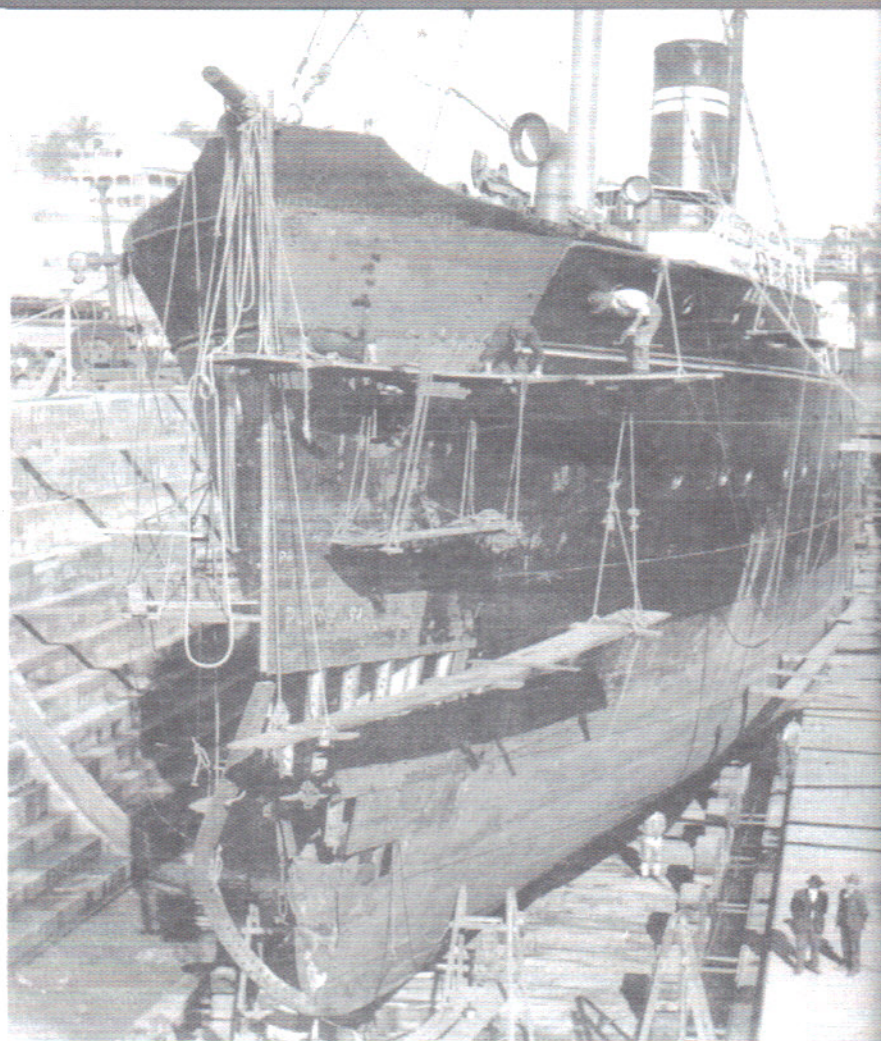


Engineer William Nisbet (right) and constructor James Overend (left) inspect progress in building the dry dock in 1877 (QMM collection)



Construction of the dry dock's altars in 1878 showing the steam engine for heavy lifting during construction (QMM collection)

SS Arawatta in dry dock to repair damage – August 1907



SS Arawatta in the dry dock to repair damage sustained in ramming and sinking the barque Ingeborg on 14 August 1907 (QMM collection)

Replacement to bow of USS Growler submarine damaged in collision with Japanese destroyer – February 1943



South Brisbane Dry Dock complex on 26 February 1943. USS *Growler* is in the dock with damaged bow removed; construction of the bomb shelter over the pump room is under way; but little progress has been made on building the Ship Repair Base. (US National Archives, RG111SC, negative #248608)

Coastal steamer Leichardt in the dock during 1885



Coastal steamer Leichardt in the dock during 1885 showing the unfinished end of the dock and an undeveloped neighbourhood (QMM collection)